STATUTORY DECLARATION

I, Sun Suk KIM, a citizen of the Republic of Korea and a staff member of Y.H.KIM INTERNATIONAL PATENT & LAW OFFICE specializing in " PLASMA DISPLAY PANEL", do hereby declare that:

(1) I am conversant with the English and Korean languages and a competent translator thereof.

(2) To the best of my knowledge and belief, the following is a true and correct translation of the Priority Document (No. P1999-52536) in the Korean language already filed with Korean Industrial Property Office on November 24, 1999.

Signed this 12th day of June, 2004

Sun Suk KIM

PATENT APPLICATION

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The present application is filed pursuant to Article 42 of the Korea Patent Act.

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ABSTRACTS

[Abstract]

The present invention relates to a plasma display panel.

The present invention includes: an upper substrate for displaying a picture; a lower substrate, sealed to the upper substrate, having a plurality of barrier ribs coated with a fluorescent material except for their top surface; a sustaining electrode, arranged at an upper portion of the upper substrate, for sustaining an emission of cells; an upper dielectric layer formed on an upper surface of the upper substrate by a firing process so as to cover the sustaining electrode; and a protective film formed on an upper surface of the upper dielectric layer and coincided with an outer surface of the barrier rib arranged at one side.

Accordingly, the plasma display panel according to the present invention prevents a discharge and a light emission pursuant to the discharge in a non-display part, not an effective display part.

[Representative drawing]

FIG. 4A

SPECIFICATION

[Title of the invention]

PLASMA DISPLAY PANEL

[Brief description of the drawings]

FIG. 1 is a disassembled perspective view showing a related art plasma display panel.

FIG. 2 is a sectional view illustrating a combined configuration of the plasma display panel shown in FIG. 1.

FIGs. 3 is a sectional view illustrating an effective display part and a non-display part of the plasma display panel.

FIGs. 4A and 4B are a perspective view and a sectional view illustrating a first embodiment according to the present invention, respectively.

FIGs. 5A and 5B are a perspective view and a sectional view illustrating a second embodiment according to the present invention, respectively.

FIGs. 6A and 6B are a perspective view and a sectional view illustrating a third embodiment according to the present invention, respectively.

<Detailed description of the reference numerals>

10 and 20 : an upper substrate and a lower substrate
11 : a sustaining electrode
11a : a transparent electrode
11b : a bus electrode
12 : an upper dielectric layer
13 : protective film
21 : a barrier rib
23 : a fluorescent material

[Detailed description of the invention]

[Object of the invention]

[Technical field including the invention and prior art therein]

The present relates to a plasma display panel, and more particularly, to a plasma display panel capable of preventing a discharge generated at a non-display part, not an effective display part in a plasma display panel.

In recent, a development of a high definition television has been partially completed. During a research progress for an improved scheme of the high definition television, an importance for a picture display device (or an image display device) has been remarkably raised. As known in the art, the picture display device includes a cathode ray tube (CRT), a liquid crystal display (LCD), a fluorescent display device (VFD) and a plasma display panel (PDP).

However, since the display devices do not satisfy the requirement of the high definition television, the picture display devices have been developed with a correlation in separate technical fields.

Among these picture display devices, the PDP displays a picture by using a gas discharge and is used for a television, a monitor and an internal or an external advertising display device because it has properties such as a high resolution, an illumination ratio, and a rapid response speed as well as a suitability of displaying a large-scale picture.

FIGs. 1 and 2 illustrate a disassembled perspective view of a related art plasma display panel and a section view of a combined configuration of the plasma display panel shown in FIG. 1, wherein a lower substrate shown in FIG. 2 depicts a state that an upper substrate is rotated by an angle of 90°.

As shown in FIG.1 and 2, in the plasma display panel, an upper substrate 10, which is a display surface for displaying a picture, is combined to a lower substrate 20 spaced by a designated distance in parallel with each other.

A lower portion of the upper substrate 10 includes a sustaining electrode 11 for sustaining a light emission of a cell by a mutual discharge in one pixel. The sustaining electrode 11 includes a couple of a transparent electrode (or a ITO electrode) 11a and a bus electrode 11b. The transparent electrode 11a is made of a transparent ITO material and the bus electrode 11b is made of a metallic material. The sustaining electrode 11 is covered with an upper dielectric layer 12, which serves to limit a discharge current and insulates the pair of electrodes from each other. A protective film 13 having a magnesium oxide MgO deposited thereon is formed on an upper surface of the upper dielectric layer 12 to easily make a discharge.

A black matrix 14 is arranged between the sustaining electrodes 11. The black matrix functions to shield light so that an external light generated by an exterior is shielded to reduce the reflection thereof and to enhance a contrast and a purity of the upper substrate 10.

Barrier ribs 21 of a stripe type (or a well type) for forming a plurality of discharge spaces, i.e., a plurality of discharge cells, are formed on the lower substrate 20 and arranged in parallel. A plurality of address electrodes 22 is arranged in parallel to the barrier ribs 21 and performs an address discharge at an area intersecting the sustaining electrode 11 to generate a vacuum violate ray.

An upper surface of the lower substrate is applied with R, G, and B fluorescent materials 23 radiating visible rays for a picture display in an area except an upper surface of the barrier rib 21 at the time of the address discharge.

A process of displaying the picture of the related art PDP having a configuration as described above will be explained as follows.

If a voltage of 150V ~ 300V is supplied to the sustaining electrode 11 and the address electrode 22 in a certain discharge cell, then a writing discharge is

occurred within the cell positioned between the sustaining electrode 11 and the address electrode 22, and a wall charge is formed an inside surface of a discharge space of the discharge cell.

Thereafter, if a sustaining discharge voltage is supplied to the sustaining electrode 11, then a sustaining discharge is easily occurred by the wall charge, formed at the address discharge, between the address electrode 22 and the sustaining electrode 11, and a light emission of the cell occurring the writing discharge is maintained during a designated time period.

That is, an electric field is generated in the cell by the discharge between the electrodes, which causes to accelerate a very small amount of electrons in discharge gases. These accelerated electrons collide with neutral particles of the discharge gases. By these collisions, the neutral particles are ionized into electrons and ions. The ionized electrons make another collision with the neutral particles and thus the neutral particles are rapidly ionized into electrons and ions to be a plasma state and, at the same time, to generate vacuum ultraviolet rays.

These vacuum ultraviolet rays excite the fluorescent materials 23 to generate visible lights. The generated visible lights are radiated externally through the upper substrate 10, so the light emission from the discharge cell can be recognized at exterior as displayed pictures.

Thereafter, if a discharge voltage of more than 150V is supplied to the sustaining electrode 11, then a sustaining discharge is occurred between the sustaining electrodes 11 in the cell, and a light emission from the cell is maintained during a designated time period.

However, the plasma display panel exhibits a problem as follows.

As described above, the sustaining electrode 11, including the transparent 11a and the bus electrode 11b, is extended in parallel up to an outer region of the barrier

rib 21 positioned at the edge of the lower substrate 20. Due to such a configuration, a discharge occurs at all regions having the sustaining electrode 11 and the protective film 13 having the magnesium oxide MgO deposited thereon due to the discharge voltage supplied to both ends.

However, the discharge occurs much more in a part without having the fluorescent materials 23 and a part without having the barrier rib 21 (or a non-display part, not an effective display part).

Thus, as shown FIG. 3, the discharge is generated at the sustaining electrode extended up to the outer region of the barrier rib, i.e., an non-display part positioned at the outermost edge of the lower substrate, not an effective display part to make the light emission by the discharge, , which entails an unnecessary power consumption .

In addition, since the light emitted by the discharge as described above is diffused at the non-display part, not the effective display part, a contrast is deteriorated, thereby deteriorating a reliance of production.

[Technical Subject Matter to be solved by the Invention]

Accordingly, it is an object of the present invention to provide a plasma display panel capable of reducing a power consumption by preventing a discharge generated in a structure that the sustaining electrode is extended up to the outer region of the barrier rib positioned at the edge of the lower substrate, not an effective display part of the plasma display panel.

It is another object of the present invention to provide a plasma display panel capable of improving a contrast of a display by shielding the diffusion of the light at the non-display part even through the light emission by the discharge is generated.

[Configuration and Operation of the Invention]

In order to achieve these and other objects of the

invention, a first embodiment according to the present invention provided a plasma display panel including: an upper substrate for displaying a picture; a lower substrate, sealed to the upper substrate, having a plurality of barrier ribs coated with a fluorescent material except for their top surface; a sustaining electrode, arranged at an upper portion of the upper substrate, for sustaining an emission of cells; an upper dielectric layer formed on an upper surface of the upper substrate by a firing process so as to cover the sustaining electrode; and a protective film formed on an upper surface of the upper dielectric layer and coincided with an outer surface of the barrier rib arranged at one side.

A second embodiment according to the present invention provided a plasma display panel including: an upper substrate for displaying a picture; a lower substrate, sealed to the upper substrate, having a plurality of barrier ribs coated with a fluorescent material except for their top surface, wherein an edge of the respective barrier ribs has a width equal to that of a space formed between the barrier ribs or has a width wider than that of the space formed between the barrier ribs; a sustaining electrode, arranged at an upper portion of the upper substrate, for sustaining an emission of cells; an upper dielectric layer formed on an upper surface of the upper substrate by a firing process so as to cover the sustaining electrode; and a protective film deposited on an upper surface of the upper dielectric layer and coincided with an outer surface of the barrier rib arranged at one side.

A third embodiment according to the present invention provided a plasma display panel including: an upper substrate for displaying a picture; a lower substrate, sealed to the upper substrate, having a plurality of barrier ribs coated with a fluorescent material except for their top surface, wherein an edge of the respective barrier ribs has a width equal to that of a space formed

between the barrier ribs or has a width wider than that of the space formed between the barrier ribs; a sustaining electrode, arranged at an upper portion of the upper substrate, for sustaining an emission of cells; an upper dielectric layer formed on an upper surface of the upper substrate by a firing process so as to cover the sustaining electrode; and a protective film deposited on an upper surface of the upper dielectric layer and coincided with an outer surface of the barrier rib arranged at one side.

These and other objects of the invention will be apparent from the following detailed description of the embodiments of the present invention with reference to the accompanying drawings.

For the sake of simplicity, elements identical to those in the related art will be assigned by the same reference numerals.

FIGs. 4A and 4B are a perspective view of a plasma display panel of a first embodiment according to the present invention and a combined section view of the plasma display panel shown in FIG. 4A. FIGs. 5A and 5B are a perspective view of a plasma display panel of a second embodiment according to the present invention and a combined section view of the plasma display panel shown in FIG. 5A. FIGs. 6A and 6B are a perspective view of a plasma display panel of a third embodiment according to the present invention and a combined section view of the plasma display panel shown in FIG. 6A.

As shown FIGs. 4 to 6, a plasma display panel according to the present invention includes an upper substrate 10 and a lower substrate 20 which are combined in parallel spaced by a designated distance.

A sustaining electrode 11 is arranged on a lower portion of the upper substrate 10. The sustaining electrode 11 includes a transparent electrode 11a and a bus electrode 11b for sustaining a light emission of a cell.

The sustaining electrode 11 is covered with an upper

dielectric layer 12 and a protective film 13 formed through a firing process. The lower substrate 20 is installed on a lower portion (or a rear portion) of the sustaining electrode 11. Such a configuration is almost identical to that of the related art plasma display panel as described above.

Referring now to FIGs. 4A to 4B, according to a first inventive part, one end part of the protective film 13 having a magnesium oxide deposited thereon is formed not to be further extended from a line coincident with the outer region on the upper surface of the upper dielectric layer 12.

Referring to FIGs. 5A and 5B, according to a second inventive part, a polarity of barrier ribs 21, coated with a fluorescent material 23 except for a top surface thereof and having a designated width, is spaced by an equal distance on the upper portion of the lower substrate 20 sealed to the upper substrate 10. In addition, the barrier ribs 21, installed at the edge of the lower substrate 20, is formed with a width equal to that of a space formed between the barrier ribs or is formed with a width wider than that of the space formed between the barrier ribs.

Referring FIGs. 6A and 6B, according to a third inventive part, one end part of the protective film 13 having a magnesium oxide deposited thereon, is formed not to be further extended from a line coincident with the outer region on the upper surface of the upper dielectric layer 12, and the barrier rib 21, installed at the edge of the lower substrate 20, is formed with a width equal to that of a space formed between the barrier ribs or is formed with a width wider than that of the space formed between the barrier ribs.

An operation of the present invention having the configuration will be described as follows.

If a voltage of 150V ~ 300V is supplied to the sustaining electrode 11 and the address electrode 22 in a

discharge cell, then a writing discharge is occurred in the cell positioned between the sustaining electrode 11 and the address electrode 22, and a wall charge is formed at an inside surface of the discharge space of the cell.

Thereafter, if a sustaining discharge voltage is supplied to the sustaining electrode 11, then a sustaining discharge is easily occurred by the wall charge, formed at the address discharge, between the address electrode 22 and the sustaining electrode 11, and a light emission of the cell occurring the writing discharge is maintained during a designated time.

That is, an electric field is generated in the cell by the discharge between the electrodes, which causes to accelerate very small amount of electrons in discharge gases. These accelerated electrons collide with neutral particles of the discharge gases. By these collisions, the neutral particles are ionized into electrons and ions. The ionized electrons make another collision with the neutral particles and thus the neutral particles are rapidly ionized into electrons and ions to be a plasma state and, at the same time, to generate vacuum ultraviolet rays.

These vacuum ultraviolet rays excite the fluorescent materials 23 to generate visible lights. The generated visible lights are radiated externally through the upper substrate 10, and the light emission of the discharge cells can be recognized at an exterior as displayed pictures.

Thereafter, if a discharge voltage of more than 150V is supplied to the sustaining electrode 11, then a sustaining discharge is occurred between the sustaining electrodes 11 in the cell, and a light emission of the cell is maintained during a designated time. Such operations are identical to those of the related art plasma display panel as described above.

According to the first to the third inventive parts, the discharge does not occur in the protective film 13 corresponding to the upper portion of the outer region of

the barrier rib 21 positioned at the edge of the lower substrate, that is, the outer portion of the effective display part. As a result, the first to the third inventive characteristic parts prevent an increment of power consumption and a light emission by the discharge, to thereby improving a contrast.

As described above, the related art has a problem that a discharge is generated at a non-display part positioned at the edge of a lower substrate, not an effective display part to make a light emission by a discharge, thereby increasing a power consumption or diffusing a light emitted by the discharge and deteriorating a contrast of a display. However, according to the present invention, it is possible to solve these problems above.

[Effect of the Invention]

As described above, the present invention is capable of reducing a power consumption by preventing a discharge generated at a non-display part not an effective display part in a plasma display panel.

Also, the present invention improves a contrast of a displayed image by preventing a discharge generated at a non-display part not an effective display part in a plasma display panel. As a result, a high picture quality of a production is maintained.

Although the present invention has been explained by the embodiments shown in the drawings described above, it should be understood to the ordinary skilled person in the art that the invention is not limited to the embodiments, but rather that various changes or modifications thereof are possible without departing from the spirit of the invention. Accordingly, the scope of the invention shall be determined only by the appended claims and their equivalents.

[What is claimed is:]

1. A plasma display panel comprising:

an upper substrate for displaying a picture;

a lower substrate, sealed to the upper substrate, having a plurality of barrier ribs coated with a fluorescent material except for their top surface;

a sustaining electrode, arranged at an upper portion of the upper substrate, for sustaining an emission of cells;

an upper dielectric layer formed on an upper surface of the upper substrate by a firing process so as to cover the sustaining electrode; and

a protective film deposited on an upper surface of the upper dielectric layer and formed in an effective part.

2. A plasma display panel comprising:

an upper substrate for displaying a picture;

a lower substrate, sealed to the upper substrate, having a plurality of barrier ribs coated with a fluorescent material except for their top surface, wherein an edge of the respective barrier ribs has a width equal to that of a space formed between the barrier ribs or has a width wider than that of the space formed between the barrier ribs;

a sustaining electrode, arranged at an upper portion of the upper substrate, for sustaining an emission of cells;

an upper dielectric layer formed on an upper surface of the upper substrate by a firing process so as to cover the sustaining electrode; and

a protective film deposited on an upper surface of the upper dielectric layer.

3. A plasma display panel comprising:

an upper substrate for displaying a picture;

a lower substrate, sealed to the upper substrate, having a plurality of barrier ribs coated with a fluorescent material except for their top surface, wherein an edge of the respective barrier ribs has a width equal to that of a space formed between the barrier ribs or has a width wider than that of the space formed between the barrier ribs;

a sustaining electrode, arranged at an upper portion of the upper substrate, for sustaining an emission of cells;

an upper dielectric layer formed on an upper surface of the upper substrate by a firing process so as to cover the sustaining electrode; and

a protective film deposited on an upper surface of the upper dielectric layer and formed in an effective part.

FIG. 1

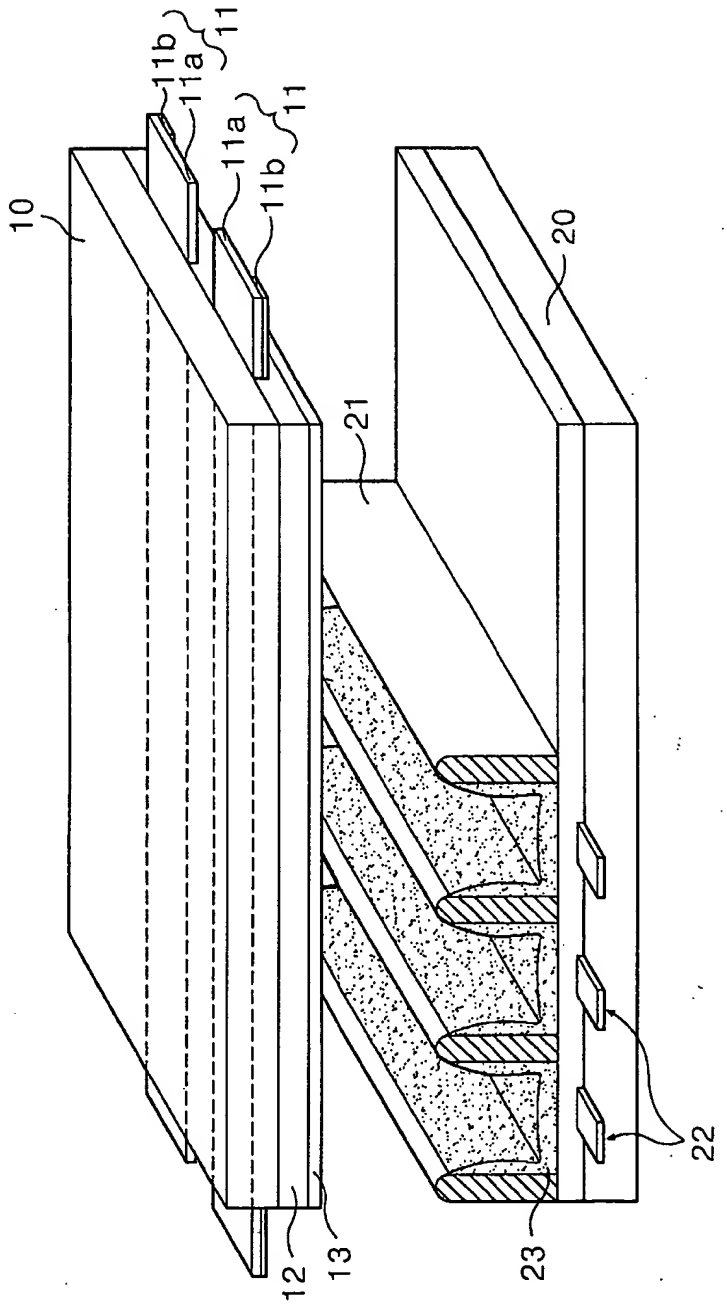

FIG.2

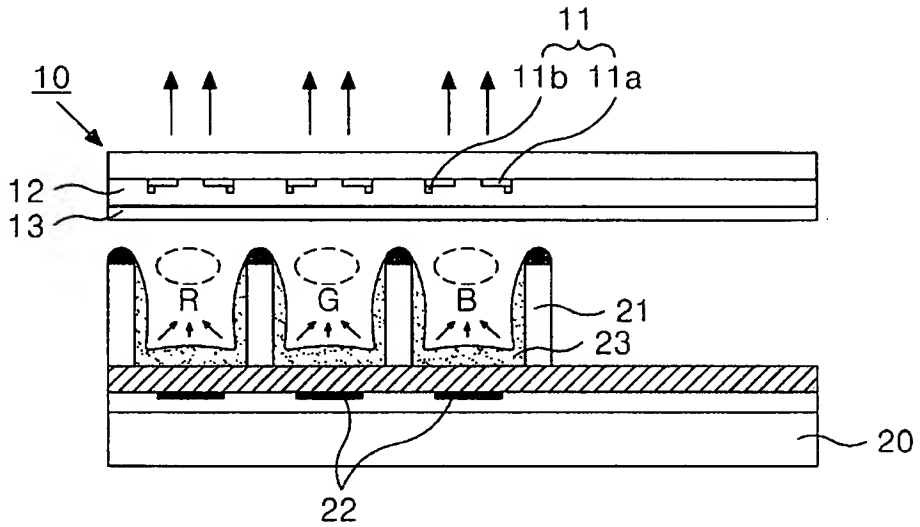

FIG.3

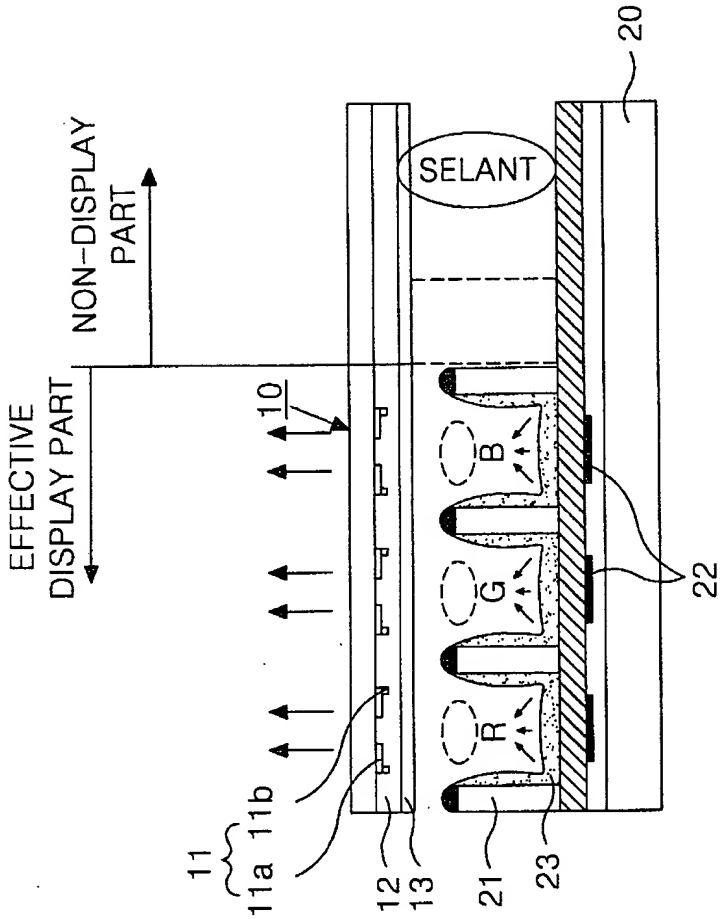
NON-DISPLAY PART
EFFECTIVE DISPLAY PART
SELANT
20
10
B
G
R
22
11
11a
11b
12
13
21
23

FIG. 4A

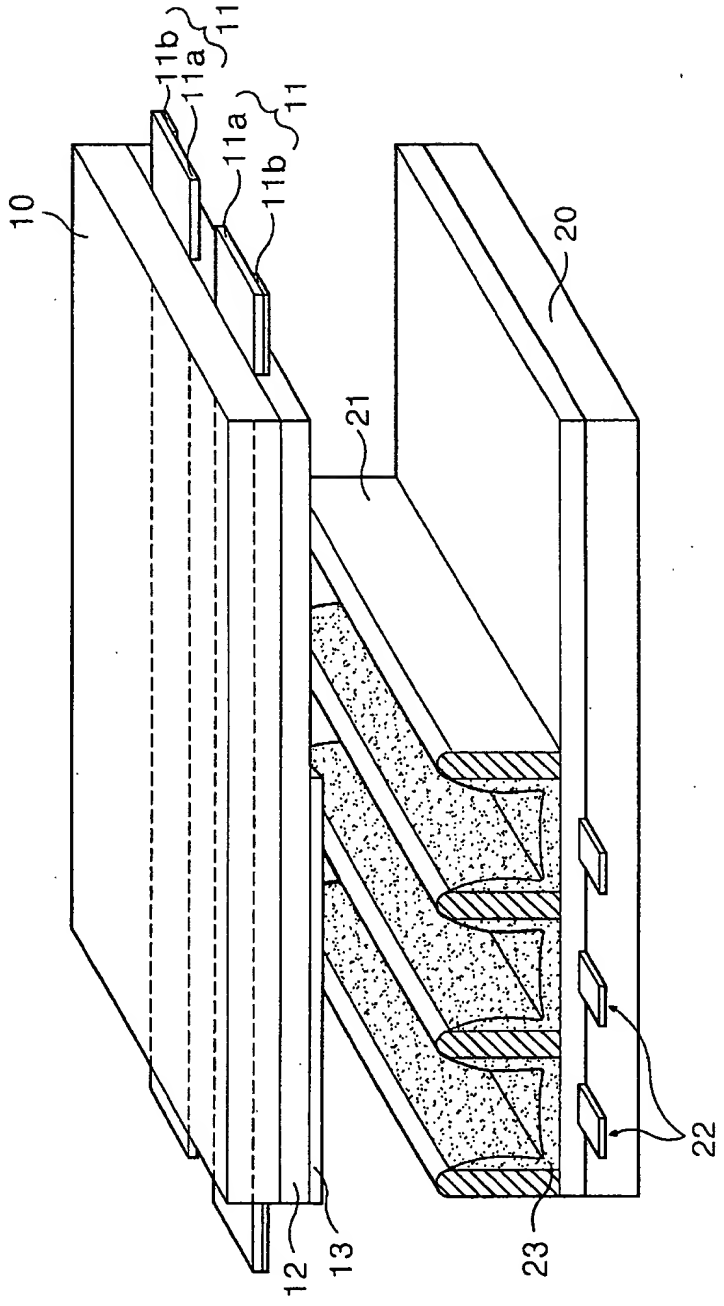

FIG.4B

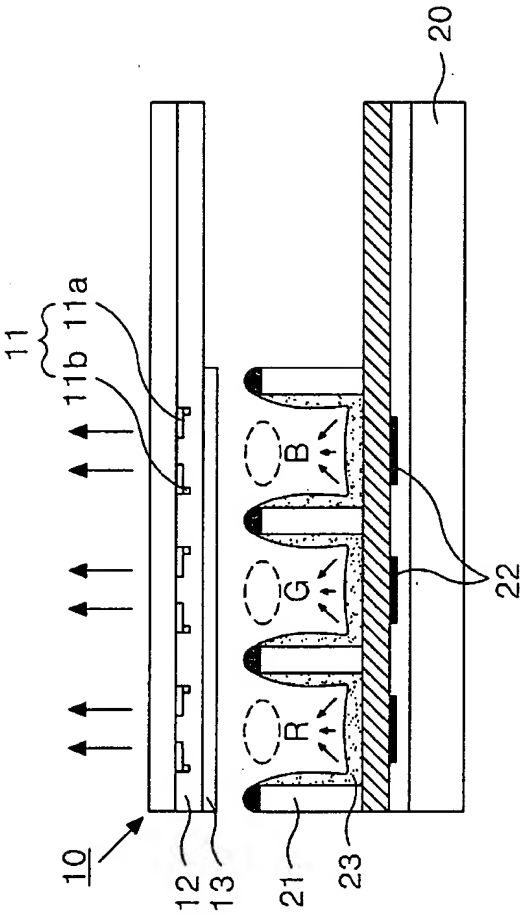

FIG.5A

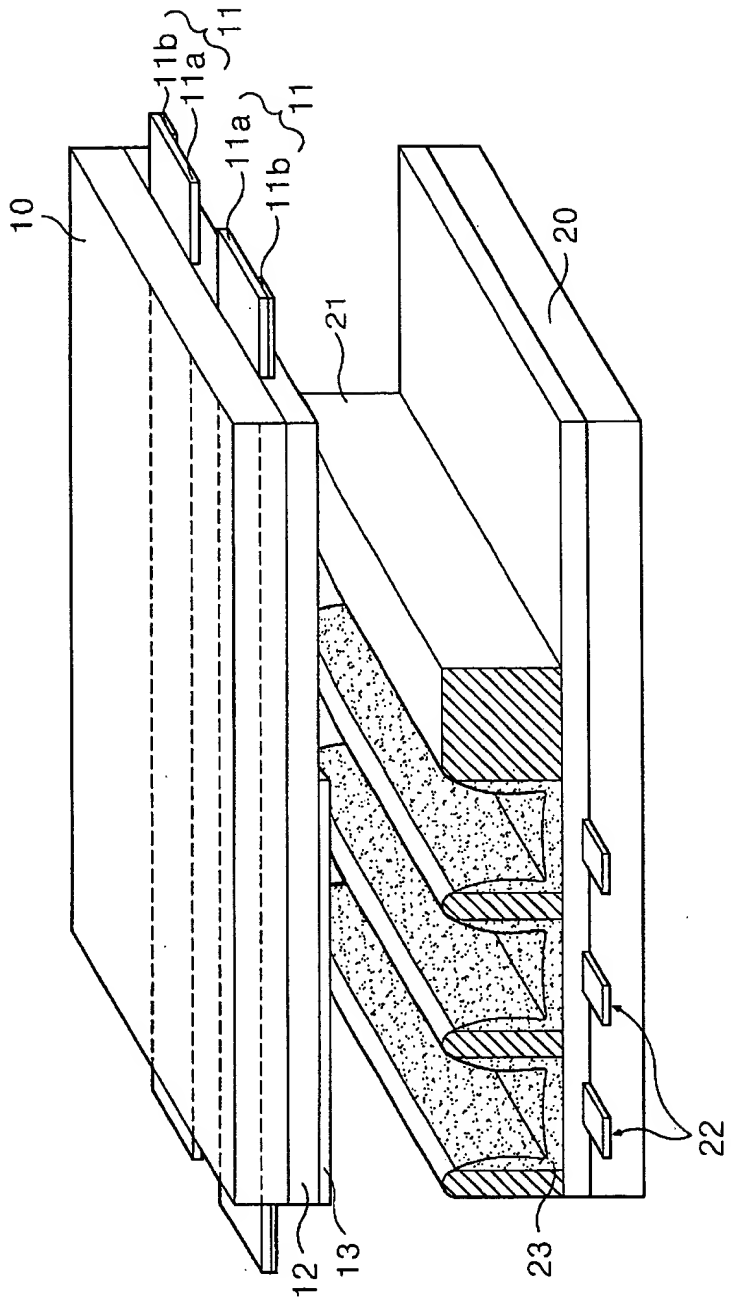

FIG.5B